

**REMARKS**

Favorable reconsideration of this application, in light of the preceding amendments and following remarks, is respectfully requested.

Claims 1-34 are pending in this application. No claims are amended, added or cancelled. Claims 1 and 15 are the independent claims.

**Rejections under 35 U.S.C. § 102(e)**

**Cabral Jr. et al.**

Claims 1-4, 7-9, 15-18, 26, 28-29 and 31-34 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Publication No. 2005/0176247 (Cabral Jr. et al., hereinafter "Cabral"). Applicants respectfully traverse this rejection for the reasons detailed below.

On page 2 of the Office Action, the Examiner states that Cabral discloses a method of forming a nickel silicide layer on an exposed silicon surface including depositing a nickel alloy layer on the exposed silicon surface, the nickel alloy including nickel and an alloying metal that constitutes no more than about 10 atomic percent of the nickel alloy, and reacting the nickel alloy layer with the exposed silicon surface to form a nickel silicide layer having an upper layer and a lower layer, wherein the alloying metal is preferentially segregated in the upper layer, because this will allegedly inherently be the case since the alloying element composition will be substantially similar to that of claims 1 and 15. Applicants respectfully disagree.

As is clear from paragraphs [0045] and [0049] and FIG. 2 of Cabral, following formation of the Ni alloy layer, an annealing process step is performed which converts a portion of the metal alloy layer into a **non-agglomerated** Ni alloy monosilicide 1 atop a Si-containing material 10 shown in FIG. 2.

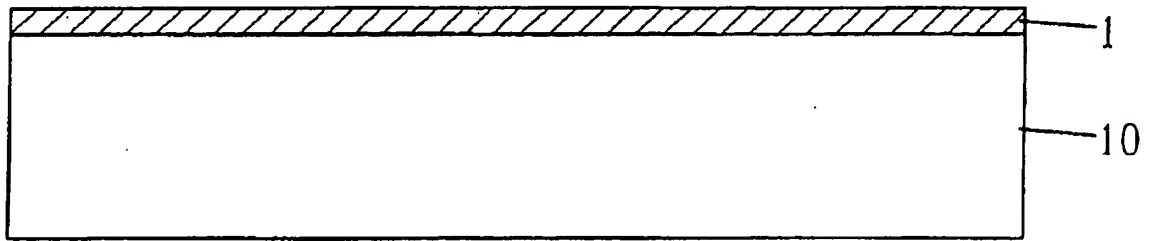


FIG. 2

Therefore, Applicants respectfully submit that Cabral does not teach or suggest reacting the nickel alloy layer with the exposed silicon surface to form a nickel silicide layer having an upper layer and a lower layer, wherein the alloying metal is preferentially segregated in the upper layer as recited in independent claims 1 and 15, but rather teaches a single non-agglomerated Ni alloy monosilicide layer.

The Applicants, therefore, respectfully request that the rejection to Claims 1 and 15 under 35 U.S.C. § 102(e) be withdrawn.

Claims 2-4, 7-9, 16-18, 26, 28-29 and 31-34, dependent on independent claims 1 and 15, are patentable for the reasons stated above with respect to claims 1 and 15 as well as for their own merits.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection to independent claims 1 and 15 and all claims dependent thereon.

**Rejections under 35 U.S.C. § 103(a)**

**Cabral Jr. et al.**

Claim 30 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Cabral. Applicants respectfully traverse this rejection for the reasons detailed below.

On page 4 of the Office Action, the Examiner states that Cabral is applied as above but does not expressly disclose the particular processing parameters of the silicidation; and that, however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum silicidation temperature and time based upon a variety of factors including the desired thermal budget and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Applicants incorporate the discussion of Cabral above, and maintain that Cabral does not teach or suggest reacting the nickel alloy layer with the exposed silicon surface to form a nickel silicide layer having an upper layer and a lower layer, wherein the alloying metal is preferentially segregated in the upper layer as recited in independent claims 1 and 15. Claim 30, dependent

on independent claim 15, is patentable for the reasons stated above with respect to claims 1 and 15 as well as for its own merits.

The Applicants, therefore, respectfully request that the rejection to Claim 30 under 35 U.S.C. § 103(a) be withdrawn.

Cabral Jr. et al. in view of Amos et al.

Claims 5-6, 10-14, 19-20 and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cabral Jr. et al. as applied to claims 1-4, 7-9, 15-18, 26, 28-29, and 31-34 above, and further in view of U.S. Patent No. 6,846,734 (Amos et al., hereinafter "Amos"). Applicants respectfully traverse this rejection for the reasons detailed below.

On pages 4 and 5 of the Office Action, the Examiner states that Cabral is applied as above but does not expressly disclose a capping layer of titanium nitride formed over the nickel alloy prior to reaction and then removed after the reaction; that Amos discloses forming a capping layer of titanium nitride 60 on the nickel alloy before reacting the nickel alloy with the exposed silicon, where the nitrogen:titanium atomic ratio is at least 0.5; and that, in view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Cabral so as to form a titanium nitride capping layer as disclosed by Amos because the capping layer prevents unwanted impurities from entering the nickel alloy layer during reaction.

Applicants incorporate the discussion of Cabral above, and maintain that Cabral does not teach or suggest reacting the nickel alloy layer with the

exposed silicon surface to form a nickel silicide layer having an upper layer and a lower layer, wherein the alloying metal is preferentially segregated in the upper layer as recited in independent claims 1 and 15. Even assuming *arguendo* that Amos could be combined with Cabral (which Applicants do not admit), the Examiner has failed to show how Amos remedies the deficiencies of Cabral with respect to claims 1 and 15.

Claims 5-6, 10-14, 19-20 and 27, dependent on independent claims 1 and 15, are patentable for the reasons stated above with respect to claims 1 and 15 as well as for their own merits.

The Applicants, therefore, respectfully request that the rejection to Claims 5-6, 10-14, 19-20 and 27 under 35 U.S.C. § 103(a) be withdrawn.

*Cabral Jr. et al. in view of Chittipeddi et al.*

Claims 21-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cabral Jr. et al. as applied to claims 1-4, 7-9, 15-18, 26, 28-29, and 31-34 above, and further in view of U.S. Patent No. 6,498,080 (Chittipeddi et al., hereinafter "Chittipeddi"). Applicants respectfully traverse this rejection for the reasons detailed below.

On page 5 of the Office Action, the Examiner states that Cabral is applied as above but does not expressly disclose forming a gate capping layer on the gate electrode and exposing silicon surfaces only on the gate electrode while covering the source/drain regions with an insulating layer; that Chittipeddi discloses exposing silicon surfaces on the gate electrode 15 while covering the

source/drain regions with an insulating layer 57 or forming a gate capping layer 17 on the gate electrode to protect an upper surface of a polysilicon layer included in the gate electrode, exposing portions of the semiconductor substrate in a source/drain region formed in the active region and exposing a silicon surface on the gate electrode; and that, in view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Cabral so as to include the silicidation processes of Chittipeddi because this allows for greater flexibility in the process since the gate and source/drain regions do not need to be all silicided or all silicided from the same material.

Applicants incorporate the discussion of Cabral above, and maintain that Cabral does not teach or suggest reacting the nickel alloy layer with the exposed silicon surface to form a nickel silicide layer having an upper layer and a lower layer, wherein the alloying metal is preferentially segregated in the upper layer as recited in independent claims 1 and 15. Even assuming *arguendo* that Chittipeddi could be combined with Cabral (which Applicants do not admit), the Examiner has failed to show how Chittipeddi remedies the deficiencies of Cabral with respect to claims 1 and 15.

Claims 21-25, dependent on independent claim 15, are patentable for the reasons stated above with respect to claims 1 and 15 as well as for their own merits.

The Applicants, therefore, respectfully request that the rejection to Claims 21-25 under 35 U.S.C. § 103 (a) be withdrawn.

**CONCLUSION**

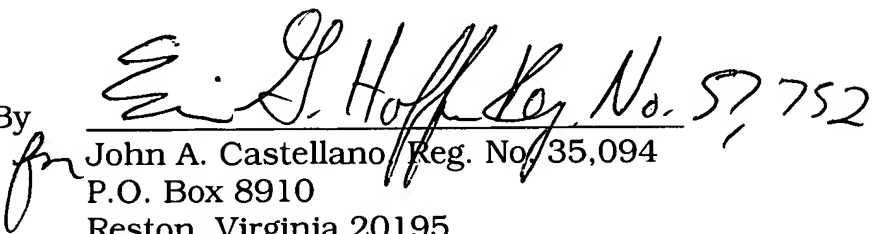
In view of the above remarks and amendments, the Applicants respectfully submit that each of the pending objections and rejections has been addressed and overcome, placing the present application in condition for allowance. A notice to that effect is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to contact the undersigned.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Erin G. Hoffman, Reg. No. 57,752, at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By  Erin G. Hoffman, Reg. No. 57,752  
John A. Castellano, Reg. No. 35,094  
P.O. Box 8910  
Reston, Virginia 20195  
(703) 668-8000

JAC/EGH:ljs